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FACTORS AFFECTING THE ORGANIZATION OF SCHOOL ATTENDANCE UNITS

By

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School of Education

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Preface

THE problem of organizing local school units in terms of efficiency and economy is one which is engaging the attention of educators thruout the country. The increased demands on the public school and exigencies of the economic depression have brought to the fore the inadequacies of the existing school units. A challenging problem, in which the public school has a significant part, is that of the reconstruction of local units of government to secure relief from burdensome taxation and to provide necessary public services with a maximum of efficiency and economy. The present study is an attempt to clarify one of the elements which is fundamental to efficient school organization.

The school attendance unit is one of the principal determining factors in the organization of efficient schools in that the size of the school is limited by the extent of the area served. Criteria for the various school functions which are related to the attendance area are essential if the local school unit is to be organized effectively. The method of segregating a single element in its relation to the local unit is a valid one in that the criteria developed for one element may result in decreased efficiency if applied to others. It is hoped that the present study will clarify some of the issues involved in organizing school attendance districts and afford some valid criteria of the adequacy of the local unit.

The author desires to express his appreciation to the many school principals and county superintendents who generously supplied the data for this study. He is also grateful to a large number of graduate students of school finance who collected the data in the field and assisted in some of the preliminary analyses.

He is indebted to Dean Henry Lester Smith and Mr. F. R. Noffsinger for making available for this study materials which were collected for another investigation concerning the school building problems involved in the reorganization of local school units. The maps of school units and other data included in these materials made possible the clarification of several factors considered in the study and were essential to a complete analysis of the problem.

R. W. H.

Table of Contents

Page

Size of School 6
Transportation 15
Density of Population 19
Rural and Urban School Units 21
The School Township 24
The County Unit 26
Summary 30

LIST OF TABLES

Table I. The Relation of Pupil-Teacher Ratios to Number of Pupils Enrolled in Six-Year and Eight-Year Elementary Schools in Indiana, 1933-34 9

Table II. Cost per Pupil Enrolled per Subject Related to Size of School, Based on 149 Indiana High Schools, 1931-1932 13

Table III. The Relationship of Pupil-Teacher Ratios to the Number of Pupils Enrolled in Four-Year and Six-Year High Schools in Indiana, 1933-34 14

Table IV. Percentages of Total Enrollments in High School Subjects as Related to Size of School, Based on 149 Indiana High Schools, 1931-32 14

Table V. Cost per Pupil per Day, Length of Route, and Number of Pupils per Route for 579 Transportation Routes in Indiana, 1932 16

Table VI. Number of Elementary and High School Pupils per Square Mile in 100 Rural Townships of Indiana, 1934 20

Table VII. Proportion of Rural Schools Located in 35 Northern Indiana Counties, That Are Within 8 Miles of an Urban School Center, 1934 23

Table VIII. Enrollments in Consolidated Elementary and High Schools of 100 Indiana Townships, 1934 25

Table IX. Areas in Square Miles of 100 Indiana School Townships .. 26

Table X. Areas of 92 Indiana Counties 27

Table XI. Areas, Number of Schools, Pupil Population, and Pupils Transported, for Five Indiana Counties with the Estimated Minimum Number of School Centers for Each County and the Estimated Increase in Pupil Transportation 28

LIST OF CHARTS

1. Cost of Instruction per Pupil Related to Size of School, based on 187 Indiana Elementary Schools, 1931-32 8
2. Cost of Instruction per Pupil Related to Size of School, based on 81 Indiana High Schools, 1931-32 11
3. Rural and Urban School Centers in 35 Counties of Northern Indiana, 1934 22

Factors Affecting the Organization of School Attendance Units

THE organization of local units has an important bearing on the efficiency and economy of a public school system. The small school district is the predominating type of local unit in the United States, and, while the district system may have been satisfactory under frontier conditions, its inadequacy as a type of organization in a modern public school system has been demonstrated. Limited educational facilities, narrow curricula, high costs, inadequate supervision, and inefficient administration are common characteristics of the small school unit. In fact, much of the inferiority of rural and village schools as compared with city schools is due to the small size of the units of organization. Consequently, the continuance of these small units will constitute an effective barrier to the organization of efficient and economical schools.

Consolidation has been advocated as the remedy for the evils of the small unit and much progress has been made in consolidating schools in several states. However, in many instances the consolidated school is too small for efficiency and economy. Some of the hindrances to effective consolidation are the limitations of the administrative and taxing units, road and weather conditions which make transportation difficult, the separation of rural and urban territory for school purposes, and sparsity of population. Of these, sparsity of population is the only one which would be difficult to overcome by suitable reorganization of the local unit. While road and weather conditions may hinder transportation, these are not insurmountable difficulties where the population is sufficiently dense to provide an enrollment large enough for an efficient school within a reasonable area.

Standards for the organization of efficient local units have not been developed to any extent. It has been suggested that these standards be developed in terms of functions of the school.[1] The factors which should be considered in organizing the local units for administration and taxation are not necessarily the same factors which should determine the individual school attendance area. Two types of local units should be considered: the local school attendance unit, and an aggregate of attendance units for administration and taxing purposes.[2] In determining the local attendance units, high school attendance areas and elementary school attendance areas need not coincide. Likewise the administrative and taxing units need not be identical.

The variety of combinations of local school units which are found in the United States indicates the lack of standards for the various functions which the local units may serve. It is the purpose of this study to investigate some of the factors which affect the establishment of efficient attendance units. The following problems are considered:

[1] The National Survey of School Finance. *Research Problems in School Finance.* The American Council on Education, Washington, D.C., 1933. pp. 141-6.

[2] *Ibid.*, p. 143.

1. What is the minimum size of school for efficient and economical instruction?
2. What are the limitations to the transportation of pupils?
3. What is the relationship of density of population to the size of the attendance area?
4. What is the effect of separating rural and urban districts on the development of efficient attendance areas?
5. How adequate is the township as the unit for attendance?
6. What are the limitations of the county unit in organizing attendance areas?

The data used in the study were collected from school systems in Indiana. While conditions in Indiana may vary somewhat from conditions in other states, the conclusions derived from the analyses presented in this study would be indicative of what might be found from similar studies elsewhere. Indiana combines industry and agriculture, neither of which predominates to a marked degree except in a relatively small area in the northwest corner of the state where several industrial cities are concentrated. The northern half of the state is a fertile agricultural region, well supplied with excellent roads and dotted with a number of cities and towns. In this section there are practically no natural barriers to the organization of efficient school units. The southern half of the state is a hilly region, much of which is not suitable for cultivation. The majority of the school units in this section have insufficient wealth to maintain schools without financial aid from the state. There are relatively few cities in this section and the rural areas are sparsely populated. In many southern Indiana communities the lack of good roads makes the transportation of pupils difficult and expensive.

The local school units in Indiana are divided into 1,016 townships, 80 towns, and 102 cities. The county serves as the unit of administration and supervision for rural schools. In most instances the local school units have the same boundaries as the civil units. In a number of townships, schools are not operated, the pupils being transferred to schools in other units. Some of the smaller towns are combined with the surrounding townships for school purposes, the township trustee being in control. There are also a number of joint-consolidated schools which serve a combination of civil units and are controlled by a joint school board. The identity of the combined units is maintained in the joint consolidated school arrangement.

Considerable consolidation has been achieved in the rural units. There are only 1,624 one-teacher schools in the state and there are more than 1,000 rural consolidated elementary schools with three or more teachers. Over 600 rural high schools are operated. Nearly 200,000 elementary and high school pupils are transported at public expense. The extent of school consolidation in Indiana indicates that efficient local school units could be established under comparable conditions.

Size of School

Size is an important factor in determining the efficiency and economy of the school. Many studies have shown that small schools result in

inadequate educational facilities, excessive teaching loads, and high costs.[3] The one- and two-teacher elementary schools are undoubtedly the weakest link in our public school system, while the small high school is usually an inferior and costly institution.

The small school is the product of the small local unit. The elimination of these schools is dependent upon the enlargement of the local unit to the point where schools of adequate size may be organized. The minimum size of school for efficient and economical operation is the principal factor to be considered in determining the size of the attendance area. While the unit for administration and school support may include several attendance areas, the size of the schools which may be organized in a local unit is one important measure of its adequacy.

The cost of operation and the adequacy of educational services are the most important elements to be considered in determining the minimum size of school. Since the cost of instruction is the largest item in operating expense, economy in instruction furnishes a valid measure of the efficiency of the school. As enrollment increases, the cost per pupil for instruction tends to decrease. One criterion for determining the minimum size of school is the point at which increased enrollment is not accompanied by decreased per pupil costs for instruction.

Two measures of the relationship of enrollment to cost of instruction are used in this study. The first measure presented is the relationship of the number of pupils enrolled in the school to the cost of instruction per pupil. The second measure used is the pupil-teacher ratio. Since teachers' salaries tend to be higher in the larger schools, the direct relationship of size to cost per pupil tends to stabilize at a lower point in enrollment than does the pupil-teacher ratio. Thus the pupil-teacher ratio affords a check on the relationship of size to per pupil costs.

The criterion of educational efficiency cannot be measured as objectively as can be the relationship of costs and enrollment, since many factors must be included in such a measure. However, educational standards are necessary if the school of minimum size is to be efficient. The breadth of educational offering, the utilization of the facilities for instruction, and the teaching load are factors which should be considered.

Since the standards for different type schools must be developed independently, the data for elementary schools and high schools are presented separately.

Elementary schools.—Chart 1 shows the relationship between the number of pupils enrolled in each of 187 Indiana elementary schools and

[3] Typical of such studies are:

Burris, Benjamin J. *The Cost of Instruction in Indiana High Schools.* Unpublished Master's Thesis, Indiana University, Bloomington, 1924. 103 pp.

Hadley, H. H. *Size of Administrative Unit and School Efficiency in Colorado.* Unpublished Master's Thesis, Colorado State Teachers College, Greeley, 1927. 194 pp.

Hart, F. W. and Peterson, L. H. "The School District System of California." *Tax Digest* 6:267-76, August, 1928.

Holy, T. D. "Relation of Size to Cost of Operation in Certain Schools of Iowa." *Journal of Rural Education* 3:317-22, March, 1924.

Roemer, Joseph E. "Weaknesses of the Small High School." *School Executives Magazine* 48:307-9, 322, March, 1929.

the cost of instruction per pupil enrolled in the schools. There is a marked decline in the cost per pupil as the number enrolled is increased to approximately 200. Between enrollments of 200 and 300 costs are somewhat irregular, while above 300 there is no discernible decrease in the cost of instruction per pupil as the number enrolled increases. This chart indicates that the stabilizing point in the relationship of enrollment and cost per pupil is approximately 300 pupils per school.

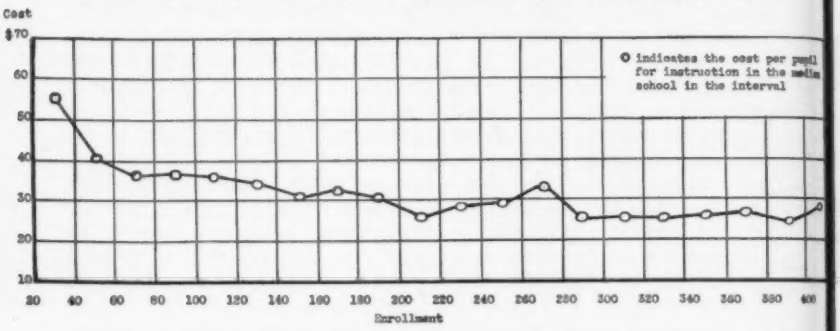
Cost
$70
60
50
40
30
20
10
O indicates the cost per pupil for instruction in the median school in the interval
20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400
Enrollment

CHART 1. Cost of Instruction per Pupil Related to Size of School, Based on 187 Indiana Elementary Schools, 1931-32

Data on pupil-teacher ratios for elementary schools are presented in Table I. The schools represented in this table were selected at random from the official Indiana school directory for 1933-34. Schools with fewer than 100 pupils enrolled are not included in this table since the size of school at which pupil-teacher ratios tend to stabilize is considerably above an enrollment of 100. Only 10 schools were selected for each of the smaller intervals since this number gives a sufficiently reliable average for the purpose. Where there are fewer than 10 schools in an interval, the number includes all of the schools of that size in the state. There is so much variation in the size of schools with more than 500 pupils enrolled that these schools were grouped in three intervals. The pupil-teacher ratios were obtained by dividing the sum of the enrollments of all the schools in the intervals by the number of teachers employed in the schools.

Pupil-teacher ratios in the six-year elementary schools reach a maximum in schools with 400 to 460 pupils enrolled. In the eight-year elementary schools there seems to be practically no relationship between size and pupil-teacher ratios. Altho the maximum pupil-teacher ratio is found in the interval of 360 to 380 pupils, it should be noted that pupil-teacher ratios decrease in eight-year elementary schools with enrollments above 500. A similar tendency is found in the six-year schools. These data indicate that the maximum efficiency as measured by pupil-teacher ratios is secured in six-year elementary schools with enrollments of 400 to 460 and in eight-year elementary schools with enrollments of 360 to 380.

TABLE I. THE RELATION OF PUPIL-TEACHER RATIOS TO NUMBER OF PUPILS ENROLLED IN SIX-YEAR AND EIGHT-YEAR ELEMENTARY SCHOOLS IN INDIANA, 1933-34

Number of pupils enrolled	Six-year schools		Eight-year schools	
	Number of schools	Pupil-teacher ratio*	Number of schools	Pupil-teacher ratio*
1000+			7	31.8
750-999			20	34.4
500-749	21	37.2	59	34.6
480-499	2	39.2	2	42.6
460-479	2	39.2	1	33.1
440-459	4	40.9	3	38.6
420-439	6	43.0	2	37.4
400-419	5	41.8	4	34.2
380-399	4	34.7		
360-379	5	39.4	10	43.5
340-359	10	37.6	8	38.9
320-339	10	38.4	4	36.7
300-319	10	40.3	10	36.9
280-299	10	37.2	10	35.8
260-279	10	37.0	10	36.0
240-259	10	37.9	11	38.2
220-239	10	36.5	10	36.5
200-219	10	32.3	10	39.6
180-199	10	33.9	10	37.3
160-179	10	32.7	10	39.5
140-159	10	31.9	10	35.7
120-139	10	33.3	10	40.6
100-119	10	29.0	10	31.4

*Pupil-teacher ratios were obtained by summing the enrollments of the schools in each interval and dividing by the total number of teachers employed in the schools.

Another factor should be considered in determining the minimum size for an efficient elementary school. From the standpoint of instruction it is desirable that each teacher have only a single grade. The minimum six-year school should have at least six teachers and the minimum eight-year school should have at least eight teachers. The typical six-year elementary school with six teachers has an enrollment of 220 to 260 pupils. The typical eight-year elementary school with eight teachers has an enrollment of 280 to 320 pupils. The pupil-teacher ratios in these typical schools range from 35 to 43, which indicates that six-year schools with enrollments of 220 to 260 and eight-year schools with enrollments of 280 to 320 approach maximum efficiency so far as pupil-teacher ratios are concerned.

Since schools of the sizes indicated above provide a single grade per teacher, they may be considered quite adequate for ordinary instructional purposes. They would be deficient, however, for such services as separate classes for atypical pupils, health service, and special instruction in such subjects as music, art, and physical education. These services could be provided only in very large elementary schools or in a

combination of smaller schools. Since schools large enough to provide these services on an economical basis could be organized only in densely populated urban centers, in the majority of communities a combination of schools for special types of instruction must necessarily be the solution to this problem. Such combinations may include both high schools and elementary schools, particularly for health service and special instruction in music, art, and physical education. In the rural areas distance may prevent the effective combination of schools for special services. However, the local administrative unit should be large enough to permit such combinations wherever they are possible.

Summarizing the analyses presented above, it is reasonable to conclude that the minimum enrollment for a six-year elementary school should be 220 to 260 pupils and for an eight-year school 280 to 320 pupils. Little would be gained in reduced instructional costs by increasing the enrollments to more than 400 in either of these types of schools.

There are other factors which should be investigated in determining the optimum size for an elementary school. The capital cost of buildings and equipment, and the expenses of operation and maintenance are no doubt related in some degree to school enrollment. Likewise, greater utilization of the physical facilities of the school would be possible as the number of pupils enrolled increases. This would be particularly true of gymnasiums, auditoriums, cafeterias, and special laboratories. Opinion differs as to the minimum size of elementary schools which affords efficient and economical use of the school plant, and there are no comprehensive studies on the problem. Moehlman recommends a minimum size of 800.[4] Schwartz has found that maintenance costs decrease as the size of the school increases.[5] Several surveys indicate that maintenance and operation costs increase as the size of school falls below 400 or 500 pupils.[6] Data are not available for determining the relation of size to efficiency and economy in factors relating to buildings and equipment for the schools included in this study. However, the evidence from other sources indicates that the cost of these factors tends to stabilize at approximately the same point in enrollment as does the pupil-teacher ratio.

It may be concluded, then, that the minimum size of elementary schools should be approximately 400, if all factors are considered. If instruction alone is considered, the minimum six-year school should have an enrollment of 220 to 260 and the minimum eight-year school an enrollment of 280 to 320.

High schools.—Chart 2 shows the relationship of enrollment to the cost of instruction per pupil for 77 Indiana high schools with enroll-

[4] Moehlman, Arthur B. *Public School Plant Program.* Rand, McNally and Co., Chicago, 1929. p. 133.

[5] Schwartz, H. M. *Improvements in the Maintenance of Public School Buildings.* Contributions to Education No. 240, Teachers College, Columbia University, New York, 1926. 74 pp.

[6] Strayer, George D., director. *Report of Survey of Certain Aspects of the Public School System of Springfield, Mass.* Board of Education, Springfield, 1923. pp. 120-5. Also *Report of the Survey of Certain Aspects of the Public School System of Providence, Rhode Island.* Board of Education, Providence, 1924. pp. 196-201. Also *Report of the Survey of Schools of Lynn, Mass.* Teachers College, Columbia University, New York, 1927. pp. 130-1.

ments of 40 to 800 pupils. As the size of school increases, there is a sharp drop in the cost curve until enrollment reaches approximately 200 pupils. Between enrollments of 200 and 400 there is apparently no decrease in cost per pupil. The schools with enrollment above 400 have the lowest average cost per pupil for instruction. Due to the limited sampling of larger schools, the enrollments which would give the lowest cost per pupil could not be determined definitely. There is evidence in this chart, however, that the cost of instruction per pupil tends to decrease as enrollments increase up to approximately 400 pupils.

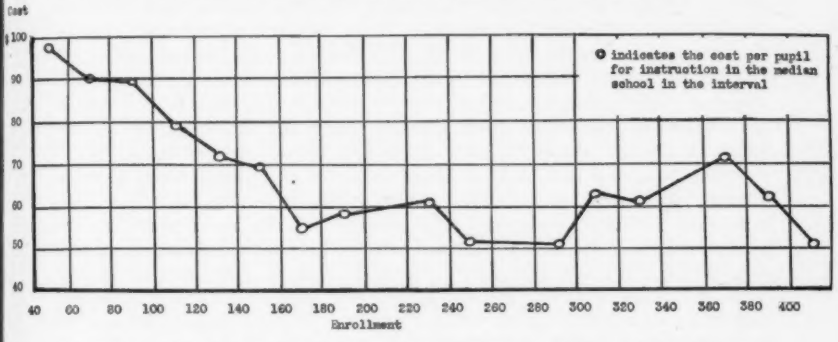

CHART 2. Cost of Instruction per Pupil Related to Size of School, Based on 81 Indiana High Schools, 1931-32

Additional evidence on the relationship of enrollment to instructional cost per pupil was secured by computing the cost per pupil enrolled in each subject offered in 149 high schools. Teachers' salaries were used as the basis for these costs. The proportion of the teacher's time which was devoted to each subject was found and the salary was allocated accordingly. Cost per pupil was found by dividing total salary cost of the subject by the number of pupils enrolled. The data are given in Table II.

Salary costs per pupil tend to reach the lowest level for the majority of subjects in schools with 250 to 350 pupils enrolled. Minimum costs for agriculture, home economics, and industrial arts are found in schools with 350 to 400 pupils. These schools happen to be rural schools in which the proportion of pupils enrolled in such subjects is relatively large. Schools with enrollments of 500 or more pupils show the lowest costs in music, physical training, and commercial subjects.

The tendency for subject costs to increase in schools with more than 300 to 400 pupils enrolled is due to the higher salaries paid teachers in the larger schools. A check on this is afforded by the pupil-teacher ratio. The relationship of pupil-teacher ratios to size of school is presented in Table III. Since approximately one-half of the high schools in Indiana include Grades 7 to 12, the data for four- and six-year schools are separated.

In the four-year high schools the pupil-teacher ratios decrease as enrollment increases up to 400 pupils. Above this point in enrollment

the pupil-teacher ratio apparently stabilizes at 27 to 28 pupils per teacher. Maximum pupil-teacher ratios in the six-year high schools are found in schools with 340 to 400 pupils enrolled. The fact that the number of pupils per teacher in six-year high schools tends to stabilize at a lower point than in four-year high schools is probably due to the relatively large proportion of the enrollment in the seventh and eighth years, which would permit large classes in these grades. Curricular offerings in the upper grades of the six-year high schools tend to be less extensive than in four-year high schools of comparable size. The practice of combining classes and alternating subjects is also more common in the six-year high schools than in the four-year high schools. These factors would account, in part, for the larger pupil-teacher ratios of the six-year high schools. Furthermore, there is some evidence that six-year high schools are inferior to comparable four-year high schools in educational efficiency, which indicates that the larger pupil-teacher ratios in the six-year schools are secured at the expense of instruction.[1]

The minimum high school should be large enough to afford a wide variety of educational offering. Two measures of this criterion are presented. An analysis of the subjects offered in Grades 9 to 12 of 149 high schools was made in order to determine the minimum size of school in which a fairly complete curriculum is provided. This analysis shows that in Grades 9 to 12, in addition to the traditional subjects, home economics was offered in all schools with 100 or more pupils; industrial arts, physical training, and health were offered in all schools of 200 or more pupils; music was offered in all schools above 250 enrollment; and art and commercial training were offered in all schools with more than 300 pupils. Since both four- and six-year high schools are included in this group, it is evident that the enrollment in Grades 9 to 12 determines the breadth of the curriculum. These data indicate that an enrollment of 300 or more pupils in Grades 9 to 12 is necessary before a complete program of courses may be offered in all schools.

A further check on educational offering was secured by computing the percentage of pupil enrollments in the different subjects offered in schools of various sizes. These percentages are shown in Table IV.

The minimum percentage of enrollments in traditional subjects is found in schools of 400 to 500 pupils. With the exception of agriculture and health, enrollments in each of the special subjects increase as the number of pupils in the school increases up to 350 to 500. The maximum percentage of enrollments for commercial subjects is found in schools larger than 800 pupils, which indicates that these subjects are most popular in the large city high schools.

Since special subjects have the maximum proportion of enrollments in schools of 400 to 500 pupils, it is reasonable to conclude that schools of this size afford sufficiently broad curricula to meet the needs of prac-

[1] Cox, B. B. *A Comparison of the Seventh and Eighth Grades in the Six-Six and the Eight-Four School Systems of Kosciusko County.* Unpublished Master's Thesis. Indiana University, Bloomington, 1930. 42 pp.

Hall, N. P. *The Training, the Experience, and Certain Attitudes of Teachers Teaching Seventh- and Eighth-Year Subjects in the Six-Year High Schools of Indiana.* Unpublished Master's Thesis, Indiana University, Bloomington, 1928. 87 pp.

Sims, J. W. *The Achievement of Eighth-Grade Pupils of Four Types of Schools in Indiana.* Unpublished Master's Thesis, Indiana University, Bloomington, 1928. 81 pp.

TABLE II. COST PER PUPIL ENROLLED PER SUBJECT RELATED TO SIZE OF SCHOOL, BASED ON 149 INDIANA HIGH SCHOOLS, 1931-32

Size of school	Average cost in dollars and cents for each pupil enrolled												
	English	Foreign language	Mathematics	Social science	Natural science	Agriculture	Home economics	Industrial arts	Commercial	Music	Art	Physical training	Health
0- 49	17.70	23.50	28.00	22.00	30.00	32.00	41.00	49.80	20.00	7.50	6.00	8.50	23.00
50- 99	13.20	19.70	16.60	16.40	17.80	35.00	32.00	30.30	21.80	7.40	11.50	8.80	12.30
100-149	9.30	16.30	14.50	12.70	14.80	21.00	26.00	18.00	21.50	8.00	24.00	5.70	8.20
150-199	10.30	13.00	10.40	10.70	13.50	18.00	28.00	34.00	17.00	8.00	20.00	7.30	6.50
200-249	10.00	11.50	12.50	10.70	14.00	33.50	27.30	24.00	18.00	8.00	6.50	4.50	9.50
250-299	9.70	11.00	12.00	13.00	14.00	49.00	19.00	25.00	23.00	6.50	18.00	6.00	10.00
300-349	12.00	12.70	12.70	12.00	18.50	31.00	24.00	24.00	13.00	7.70	15.00	7.00	13.00
350-399	12.50	12.50	14.00	12.00	16.00	14.00	12.00	13.00	13.50	8.50	20.00	11.50	12.00
400-499	14.50	14.00	12.00	12.50	17.50	31.00	14.50	22.00	16.00	8.00	14.00	8.00	10.00
500-799	11.60	11.60	13.00	11.00	17.30	27.00	19.50	22.00	13.30	12.00	13.00	3.30	10.00
800+	12.50	12.30	12.00	12.50	18.00	.....	19.00	24.00	12.20	6.30	23.00	4.30	14.00

TABLE III. THE RELATIONSHIP OF PUPIL-TEACHER RATIOS TO THE NUMBER OF PUPILS ENROLLED IN FOUR-YEAR AND SIX-YEAR HIGH SCHOOLS IN INDIANA, 1933-34

Number pupils enrolled	Grades 9-12		Grades 7-12	
	Number of schools	Pupil-teacher ratio	Number of schools	Pupil-teacher ratio
1000+	15	26.6	.....	.....
750-999	8	27.3	2	31.0
500-749	10	28.0	5	24.5
400-499	5	27.8	4	27.1
380-399	1	22.9	6	31.6
360-379	3	23.1	1	26.4
340-359	4	24.6	4	29.8
320-339	2	22.0	3	28.3
300-319	4	22.6	3	23.3
280-299	4	21.1	9	24.4
260-279	3	23.8	10	26.5
240-259	4	20.4	10	25.3
220-239	5	22.5	10	28.4
200-219	6	21.7	10	24.7
180-199	9	22.5	10	23.8
160-179	10	21.3	10	22.1
140-159	12	20.2	10	22.1
120-139	21	23.7	10	20.3
100-119	30	21.9	10	20.0

tically all pupils. The fact that enrollments in traditional subjects tend to increase in the schools larger than 500 enrollment indicates that the offerings in special subjects are no more attractive to pupils in the large schools than to those in the schools with enrollments of 400 to 500.

TABLE IV. PERCENTAGES OF TOTAL ENROLLMENTS IN HIGH SCHOOL SUBJECTS AS RELATED TO SIZE OF SCHOOL, BASED ON 149 INDIANA HIGH SCHOOLS, 1931-32

Enrollment in school	Total subject enrollments in all schools	Percentage of enrollments in each subject								
		Traditional subjects*	Agriculture	Home economics	Industrial arts	Commercial	Music	Art	Physical training	Health
0- 49	4,199	59	3	3	1	2	16	7	6	3
50- 99	21,140	62	3	3	2	8	9	2	9	2
100-149	16,444	61	1	4	4	7	9	2	9	3
150-199	11,911	57	2	4	3	7	11	1	9	6
200-249	5,279	59	2	3	2	8	5	3	12	5
250-299	12,704	65	1	4	3	7	4	1	12	2
300-349	14,499	58	2	5	4	8	5	2	12	4
350-399	6,189	54	2	6	7	10	6	2	10	3
400-499	8,438	52	1	5	5	7	9	4	14	2
500-799	29,594	60	1	4	6	9	5	2	9	3
800+	52,566	59	0	4	6	10	5	1	11	3

*Includes English, mathematics, social science, natural science, and foreign language.

Data were not available to determine the relationship of size of school to cost of building and equipment and the utilization of the physical facilities of the school. While it is possible that the highest degree of efficiency in the use of building and equipment may be secured in schools considerably larger than 400 pupils, the total advantage of the larger school due these factors would be relatively small.

Summarizing the evidence relative to the cost of instruction and the adequacy of educational offering, a desirable minimum size of high school is approximately 400 pupils enrolled in Grades 9 to 12. Below this point costs tend to increase rapidly and curricula become inadequate, particularly when the enrollment drops below 300. Nanninga,[8] in his study of California high schools, found that schools of 500 to 600 approached maximum efficiency, which would indicate that 400 might probably be acceptable as a minimum for a four-year high school. A desirable minimum for a six-year high school may include fewer than 400 pupils in Grades 9 to 12. However, the evidence available for this study indicates that the enrollment in the upper four grades of a six-year school cannot be much less than the minimum four-year school if a comparable degree of efficiency is secured.

Transportation

In rural sections pupils must be transported if schools of efficient size are to be maintained. The area to be included in a rural school attendance unit will be determined to a large extent by the practical limits of school transportation. Roads, weather conditions, density of population, the distance which children can be transported economically, and the time required to make the trip to and from school are factors which must be considered in organizing attendance areas which involve the transportation of pupils. Where there are natural barriers to transportation or the population is extremely sparse the attendance unit must be defined in terms of these factors. In such cases definite standards for transportation can hardly be applied. The standards suggested in this study are based on the assumption that transportation is feasible and that the routes may be organized in terms of the standards.

There are many factors which affect the efficiency and economy of pupil transportation. In this study only those factors which are directly related to the size of the attendance unit are considered.

These factors are:

1. The maximum distance which pupils should be transported.
2. The relationship of distance and number of pupils transported per route to the transportation costs per pupil.
3. The maximum area of the attendance unit which may be secured within the limits of economical transportation distance.

Length of route.—The most important factor to consider in determining the length of the route is the time which pupils spend on the road to and from school. Consensus of opinion indicates that the time should not exceed one hour each way. For small children a shorter

[8] Nanninga, S. P. "Costs and Offerings in California High Schools in Relation to Size." *Journal of Educational Research* 24:356-64, December, 1931.

time is desirable, while for high school pupils one hour may be slightly exceeded.[9] In sparsely populated areas more than one hour may be required to collect a bus load of pupils and transport them to school, but these should be considered as extreme cases due to natural causes that cannot be corrected thru organization of bus routes.

The distance traveled by a school bus in the maximum time allotted will depend on several factors. Road conditions which prevent reasonable speed, dense population which requires frequent stops, and crossroads, railroads, and other hindrances to continuous travel tend to decrease the distance that may be traversed in a given time. An investigation of bus speeds in a densely populated area showed that buses average approximately 12 miles per hour from the school building to the end of the route.[10] In typical rural sections of Indiana buses cover routes of 10 to 12 miles in 40 to 60 minutes. Average speeds range from 15 to 20 miles per hour depending on road conditions and the number of stops to be made. If the travel time is limited to one hour, 15 to 20 miles would be the maximum distance for a transportation route.

Another criterion which may be used to determine the standard length of route is the distance which pupils are transported on established routes. Data for 579 school bus routes in seven Indiana counties[11] are summarized in Table V. The average distance traveled one way is 9.9 miles and the standard deviation of the distances is 4.25 miles. The longest route reported for these seven counties is 24 miles. In two counties where the region is rolling and the roads somewhat inferior, the routes average one to two miles shorter than the average for the group. In three counties where road conditions are excellent and the population predominately rural the average route is two to three miles longer than the average for the group. However, in these seven counties which represent a variety of local conditions, very few routes are longer than 20 miles. Estimated from the mean and the standard deviation, approximately 12 per cent of these 579 bus routes exceed 15 miles.

TABLE V. COST PER PUPIL PER DAY, LENGTH OF ROUTE, AND NUMBER OF PUPILS PER ROUTE FOR 579 TRANSPORTATION ROUTES IN INDIANA, 1932

	Average	Standard deviation
Cost per pupil per day in cents	14.4	5.6
Length of route in miles	9.9	4.3
Number of pupils per route	31.0	11.9

[9] "Bus Transportation of Pupils." *American School Board Journal* 79:120, November, 1929.

Little, Harry A. *Public Transportation of School Pupils in Arkansas.* State Department of Public Instruction, Little Rock, 1930.

Muerman, J. C. "Transportation of School Children at Public Expense." *National Education Association Proceedings* 60:495-7, 1922.

United States Department of the Interior. "School Consolidation and Rural Life." *Rural Education Leaflet,* no. 2, 1922.

[10] Data from Marion County, Indiana.

[11] Benton, Fulton, Lawrence, Marion, Montgomery, Parke, and Rush counties.

If current practice may be accepted as a basis for determining the standard length of transportation routes, these data would indicate that 15 miles is a desirable maximum distance and that 20 miles approaches the practical limit to the distance which children should be transported. While much longer routes are reported in other studies of school transportation, distances exceeding 20 miles can hardly be justified except under peculiar local conditions.[12] Excessively long routes are neither necessary nor desirable in sections similar to the seven counties from which the above data were secured.

The number of pupils which may be comfortably and safely hauled in a bus may limit the length of the transportation routes, particularly in densely populated areas or where roads are poor. The average number of pupils transported per bus on 579 routes is 32. The standard deviation of the number is 11.9. In four of the seven counties the largest loads exceed 50 pupils and in all of the counties the largest loads exceed 40 pupils. The highest average number of pupils per bus is found in Marion County, which is the most densely populated county of the group. The average load is 39, and the maximum load is 45. Routes in this county average only nine miles in length, which indicates that the length of route may be decreased as density of population increases. The fact that transportation per pupil per day in Marion County costs less than in five of the six other counties shows that shorter routes are justified if the buses can be filled to capacity from the smaller area. In sections of several of the counties road conditions are such that the number transported is necessarily small. However, this applies to only a few routes. Approximately one-fourth of the buses in the seven counties carry more than 40 pupils. This is sufficient evidence to show that the size of the load does not limit the length of the route until the number of pupils per bus reaches 45 or 50.

The evidence presented in this section indicates that attendance units should not exceed an area which would require transportation routes longer than 15 miles. Routes as long as 20 miles should be the exception. The maximum number of pupils per bus under average conditions should be 45 to 50 pupils. In densely populated localities, the optimum length of route may be less than 15 miles if capacity loads can be collected in shorter distances.

The relation of transportation costs to the length of route and number transported.—Studies by Davies,[13] Evans,[14] Hutchison,[15] Little,[16]

[12] Geiger, Charles W. "Transportation for Union High School in California." *American School Board Journal* 77:45-6, 143, October, 1928.

[13] Davies, C. T. *Transporting School Children in Certain Counties of Florida.* Unpublished Master's Thesis, Duke University, Durham, N.C., 1931. 130 pp.

[14] Evans, Frank O. *Factors Affecting the Cost of School Transportation in California.* U.S. Department of Interior, Office of Education Bulletin, no. 29, Washington, D.C., 1930. 42 pp.

[15] Hutchison, C. S. *Pupil Transportation in Logan County, Ohio, School Districts.* Unpublished Master's Thesis, Ohio State University, Columbus, 1930. 62 pp.

[16] Little, Harry A. *Public Transportation of School Pupils in Arkansas.* State Department of Education, Little Rock, 1930. p. 23.

Mothersead,[17] and Payne[18] show that the cost per pupil for transportation decreases as the number of pupils hauled and the length of the route increases. These studies show that small buses traveling over short routes result in high costs per pupil transported, while long routes and large loads tend to decrease the cost to a minimum.

Data are available on the length of the route, the number of pupils transported per route, and the cost of transportation for 579 transportation routes in seven Indiana counties. The averages and standard deviations for these factors were given in Table V.

The standard deviations of the measures given in Table V indicate that there is considerable variation in all of these factors. The wide variations noted are due to a combination of many local factors which are difficult to measure. All of these routes are contracted for by the trustees with the owners of the buses. The law requires that the contract be let to the lowest bidders, but no doubt much of the variation in cost per pupil, size of load, and number of pupils per route might have been eliminated by more efficient administration of transportation.

In order to discover the relationship existing between cost per pupil per day, the length of the route, and the number of pupils per route, correlation coefficients have been computed from the data. The correlation coefficients for the cost per pupil and the miles per route vary from —.08 to .43 when the data for each county are correlated separately. The correlation coefficient of these two factors for the 579 routes is .08, which indicates that the length of the route has little influence on the transportation cost per pupil per day.

The correlation coefficients for the number of pupils per route and the cost per pupil varies from —.38 to —.68 when the counties are considered separately. When the correlation includes the total group, the coefficient is —.60. This correlation shows that the number of pupils transported per route is the most important factor affecting the cost of transportation.

As the length of the route is increased the number of pupils transported per route increases likewise. For the total group of routes the correlation of miles per route and number of pupils is .25. The correlations of these factors in the various counties range from .15 to .59. Since the density of population varies considerably in the seven counties, the relationship of distance and number of pupils is necessarily low when all the routes are considered. In the more densely populated sections, large numbers of pupils are collected in relatively short routes, while in sparsely populated communities the number of pupils transported on long routes is frequently small.

In order to find the relative weights of the miles per route and of the number of pupils in determining the cost per pupil per day, the partial regression equation for estimating cost per pupil per day has been computed.

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[17] Mothersead, C. B. *Unit Costs of Transportation in Oklahoma.* Unpublished Master's Thesis, University of Oklahoma, Norman, 1927. 64 pp.

[18] Payne, James O. *A Study of the Administration of Pupil Transportation in Centralized Schools in Oklahoma, 1928-1929.* Unpublished Master's Thesis, Oklahoma Agricultural and Mechanical College, Stillwater, 1930.

Letting: $X_1 =$ cost per pupil per day in cents
$X_2 =$ miles per route
$X_3 =$ number pupils per route
$r_{13.2} = .45$
$r_{12.3} = -.65$
$X_1 = .324X_2 - .313X_3 + 20.91 \pm 4.3$

The partial correlation coefficients show that lengthening the routes without increasing the number of pupils increases the cost, as would be expected. Likewise, increasing the number of pupils but keeping the length of the route constant decreases the cost per pupil materially. When the factors of miles per route and pupils per route are combined, the regression equation indicates that the increased cost per pupil for each mile the route is lengthened is approximately equal to the decrease in cost secured by adding one pupil to the load. In other words, the cost per pupil per day is decreased by lengthening the route if more than one pupil is added for each additional mile. This conclusion would be true, of course, only under average conditions, as the error of estimate is relatively large. However, it is reasonable to conclude from these data that transportation costs per pupil per day may be decreased to a minimum by increasing the number of pupils per route and the length of the routes up to practical maximums. The most efficient organization of transportation would transport the pupils in a minimum number of buses, traveling over maximum distances. The practical limits to transportation, then, are the distance which children can be transported and the maximum size of the loads which may be carried.

The area of the attendance unit as determined by transportation.—Accepting 15 miles as the desirable maximum distance which children should be transported, the standard area for an attendance district should not exceed a size which would include pupils more than 15 miles transportation distance from the school. Since the transportation routes do not proceed in a direct line to the school, the radius of the attendance area must be less than 15 miles. An examination of routes in a number of localities indicates that 8 miles approaches the maximum radius of an attendance area which would place all children within 15 miles transportation distance of the school. A unit of this size would include an area of 200 to 250 square miles. Within a unit as large as this, transportation could be routed to obtain a maximum degree of efficiency, capacity loads could be secured, and costs could be reduced to a minimum. While local conditions may dictate a unit smaller than that suggested above, the analysis of the factors affecting transportation costs indicates that under average conditions the greatest economy would be secured by extending the attendance area to the maximum size permitted by transportation.

Density of Population

The size of school in rural sections is limited by the distance which pupils can be transported and the density of population within the area which the school serves. In sparsely populated districts there may not

be a large enough number of pupils within reasonable transporting distance of the school to permit the organization of schools with desirable minimum enrollments. In more populous localities, large schools frequently can be organized within a unit smaller than the maximum area which can be served by transportation routes.

Standards for the minimum size of elementary and high schools and the maximum area for the attendance unit have been suggested in previous sections of this study. The purpose of this section is to ascertain the extent to which attendance units not exceeding a radius of 8 miles from the school center would provide pupils in sufficient numbers to permit the organization of schools with the minimum standard enrollments.

One hundred townships have been selected at random from all of the counties of Indiana and the area and number of pupils for each township have been secured. The number of pupils per square mile has been computed for each township. There are no incorporated cities or towns located in any of these townships. Since every county in Indiana is represented by one or more townships, this sample can be accepted as representing typical rural communities in the state. In order to eliminate any territory where transportation of pupils is not possible, only those townships have been selected which operate a consolidated school serving the entire township. In no case does the attendance area extend outside of the township.

The distribution of the 100 townships arranged according to the number of pupils per square mile per township is given in Table VI.

TABLE VI. NUMBER OF ELEMENTARY AND HIGH SCHOOL PUPILS PER SQUARE MILE IN 100 RURAL TOWNSHIPS OF INDIANA, 1934

Number of pupils per square mile	Number of townships	
	Elementary pupils (Grades 1-8)	High school pupils (Grades 9-12)
10+	6	0
9	5	0
8	9	1
7	11	1
6	19	1
5	30	5
4	17	11
3	3	20
2	0	49
1	0	12
Total	100	100
Median	5.5	2.3

The density of school population in the median township is 5.5 elementary pupils per square mile and 2.3 high school pupils per square mile. The most sparsely populated township in the group has averages

of 3 elementary pupils and .8 high school pupils per square mile. In the most densely populated township the averages are 13.9 elementary pupils and 6.7 high school pupils.

Estimated on the basis of the density of school population, an attendance unit of maximum radius of eight miles would include approximately 600 elementary pupils and 160 high school pupils in the most sparsely populated sections and approximately 2,800 elementary pupils and 1,300 high schools pupils in the most densely populated sections. In the sections with average density of school population an attendance unit with an eight-mile radius would have located in it approximately 1,100 elementary pupils and 460 high school pupils.

It is evident that all of the territory of which these 100 townships are representative could organize an elementary school of 300 or more pupils within the limits of the maximum transportation distance. The density of high school population in 30 townships is so low that high schools with 400 or more pupils enrolled could not be organized in an attendance area of 200 square miles. In localities where the pupil population is as sparse as it is in these townships, it would not be possible to maintain high schools of minimum standard enrollment without exceeding the standard maximum transportation distance. The only solution to the problem is to extend the attendance unit if pupils can be transported the necessary distances, otherwise small high schools must be operated if the pupils are to have the advantages of a high school located within the unit.

Since the number of elementary pupils in Indiana is approximately three times as great as the number of high school pupils, it is evident that a high school attendance area may include several elementary attendance areas with a high degree of efficiency maintained in both units. Local conditions will determine the extent to which the elementary unit and the high school unit should overlap.

Rural and Urban School Units

It is the prevailing practice in the United States to separate rural and urban territories for school purposes. The urban units generally are identical with the limits of the civil corporation while the surrounding rural area may be organized into units of various types. Many consolidation projects involve both rural and urban districts, and in those states in which the county is the basic school unit there is a variety of units which combine cities and towns with rural districts for purposes of taxation, administration, and attendance. However, in the typical school organization separate and distinct rural and urban units are maintained.

There are many elements involved in the relationship of city and country, and their proper combination for governmental and social purposes is an exceedingly complex problem. However, the incorporated town or city is a logical school center and in most cases could be made to serve the surrounding rural territory within transportation distance were it not for the separation of cities and towns from the rural districts for administrative and taxing purposes. The area served by the

school center usually is confined to the units of administration and taxation which are defined by the boundaries of the civil corporation. This is well illustrated in Indiana. The school law makes provision for the voluntary consolidation of existing units[19] and also for the transfer of pupils from one unit to another.[20] While there are a number of consolidated units as well as many townships which transfer all pupils to schools in other units, the possibilities of combining rural and urban units for school purposes far exceed the practice. In many instances pupils who reside almost within city or town limits are transported several miles to a rural school. In other cases pupils are transported thru a town or city to township schools outside the corporate limits. Such practice prevents economical and efficient school organization.

Chart 3 shows the location of rural and urban school centers in 35 counties of northern Indiana. There are practically no natural barriers to transportation of pupils in these counties; almost without exception, attendance areas of maximum size could be organized thruout this part of the state. Rural school consolidation has reached the highest development in Indiana in this section, the majority of the rural units having achieved some degree of consolidation. In many of these counties every township unit operates a consolidated elementary and high school.

The circles shown on Chart 3 represent an area with a radius of eight miles, with an incorporated town or city as the center. Thus all of the area within the circle is within school transportation distance of the city or town at the center. Only those towns which maintain a school organization separate from the township are shown as towns on this map; the towns in which schools are under township control are shown as rural consolidated schools. It is interesting to note that in several counties practically all of the rural territory is within transportation distance of an incorporated city or town. In these counties it would be necessary to operate few, if any, schools outside of the urban centers. In other counties, where there are fewer urban corporations, rural schools would be necessary. Since there are a large number of unincorporated villages located thruout this section, many of these would be logical rural school centers.

In the area represented in Chart 3 there are 823 rural school centers. Of these, 340 are one-teacher elementary schools, 190 are two- to four-teacher elementary schools, 43 are graded elementary schools with five or more teachers, and 250 are consolidated elementary and high schools. There are 575 of these rural schools within 8 miles of one or more urban centers. There are 239 one-teacher elementary schools in the counties represented in Chart 3 that are within transportation distance of an incorporated city or town. Of the rural consolidated elementary and high school centers, 157 are within the 8-mile radius of an incorporated school city or town. The data are summarized in Table VII.

[19] *School Laws of the State of Indiana.* State Department of Public Instruction, Indianapolis, 1932. Sec. 326-54.

[20] *Ibid.*, Sec. 453.

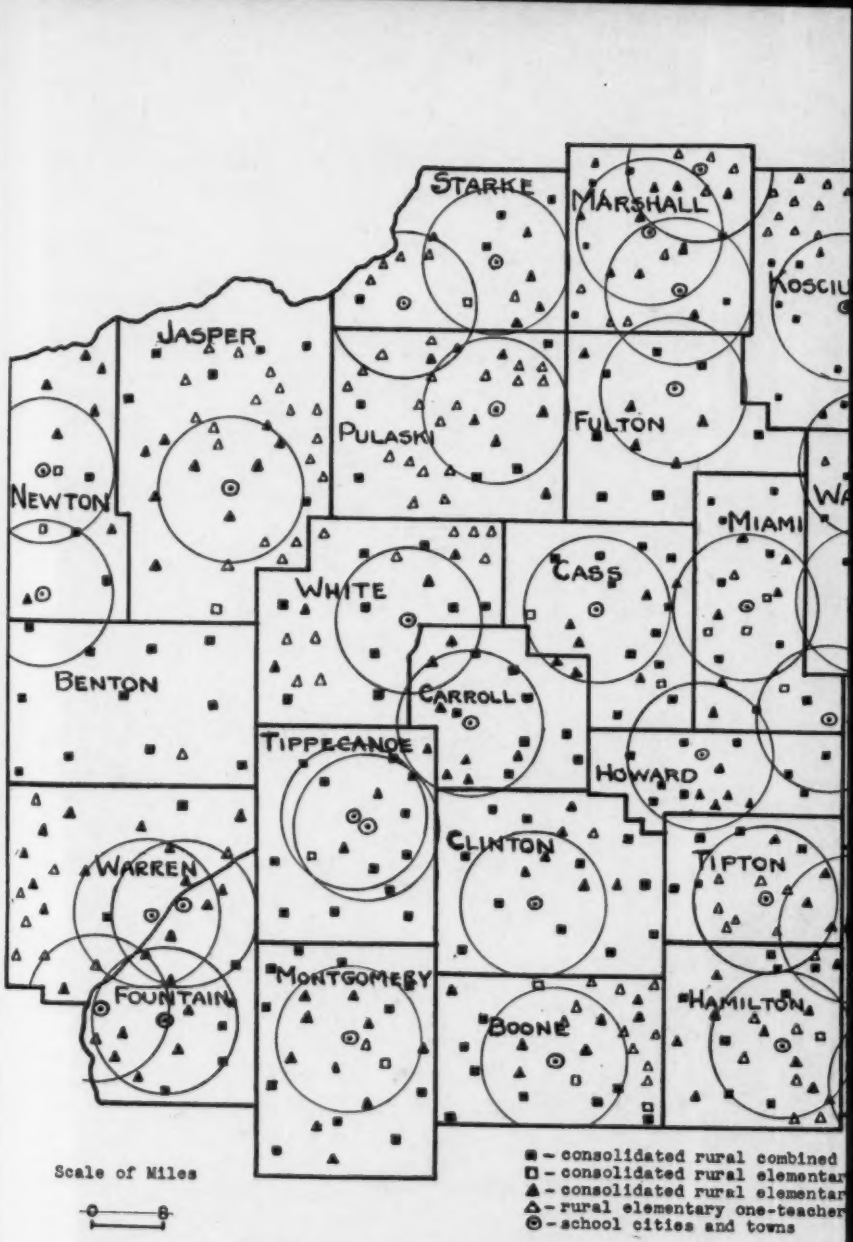
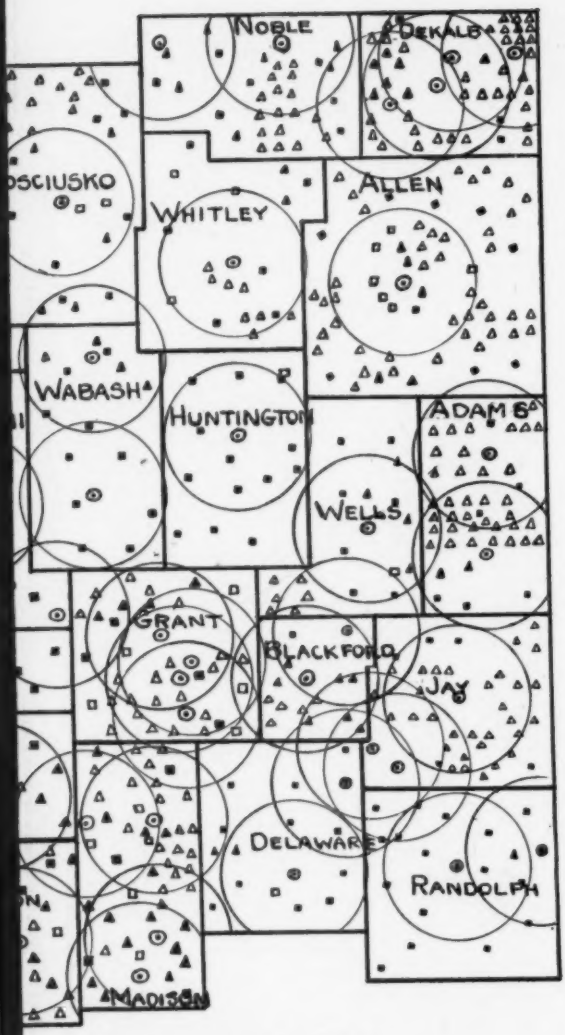


CHART 3. Rural and Urban School Centers in 35 Counties of



bined elementary and high schools
mentary schools with more than four teachers
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ties of Northern Indiana, 1934

TABLE VII. PROPORTION OF RURAL SCHOOLS, LOCATED IN 35 NORTHERN INDIANA COUNTIES, THAT ARE WITHIN 8 MILES OF AN URBAN SCHOOL CENTER, 1934

Type of rural school	Total number of rural schools	Number within 8 miles of an urban school center
One-teacher elementary	340	239
Two- to four-teacher elementary	190	146
Five or more teacher elementary	43	33
Consolidated elementary and high school	250	157
Total	823	575

The data presented in Chart 3 and Table VII furnish a striking illustration of the advantages of combining rural and urban school districts. If town and city school units were to be organized to serve the adjacent rural territory which is within transporting distance, the number of consolidated rural schools which would be necessary in these counties of northern Indiana would be less than one-fourth of the number now in operation. In the more densely populated counties, all of the pupils could be transported readily to an urban school center.

There may be valid objections to the suggested combination of rural and urban districts, which have not been given consideration in this study. However, it is doubtful whether the educational advantages and the economies in school operation which it is possible to secure in large school attendance units would be offset to any great extent by the disadvantages arising from other elements. The fact that rural and city communities are becoming increasingly interdependent, socially, culturally, and economically, may be a valid argument for combining them for educational purposes. Problems of taxation and administration have some bearing on the development of the optimum local unit. Other forces which are obscure at the present time may also merit investigation. However, it is evident that the separation of rural and urban school districts tends to prevent the organization of the most efficient type of school attendance units.

The extent to which unincorporated villages should serve as rural school centers is a moot question. There may be some validity to the argument that, since the village is often the nucleus of a homogeneous community, a school should be located in it. In many localities the village is the logical center of an area which would be large enough to include the number of pupils necessary for an economical and efficient school. However, where the villages are small and the distance between them is only a few miles, it is hardly possible to establish village schools which would meet the minimum standards of efficiency. In many instances the village could be made the center for an elementary school attendance area, and several such areas could be combined for high school purposes. Such an arrangement would reduce the transportation required for elementary pupils and eliminate many small high schools. The location of villages within the administrative unit and the distribution of the farm population would determine the extent to which schools

should be established in the villages. The optimum combination of village units is largely a problem to be solved in terms of local conditions.

The School Township

The township is the rural school corporation in Indiana. It is also a civil administrative unit for taxation, poor relief, and road maintenance. The schools are under the control of the township trustee who is elected by popular vote for a term of four years. In each township there is an advisory board of three members who approve the budgets of the trustee and fix the tax levies of the township. The advisory board also acts in other fiscal matters such as bond issues, transfer of funds, and temporary loans. The trustee, however, has practically autocratic control, within the limits of the school law, over all the school affairs of the township. The county superintendent, who is elected by the township trustees of the county sitting as a county board of education, has general supervision of instruction in the rural schools. The superintendent's authority and responsibility for administering the schools is restricted to a few functions, the direct administration being the responsibility of the trustee.

There is extensive consolidation of rural schools in Indiana, the majority of the townships being consolidated to some degree. In most cases the township is the unit of consolidation, the exceptions being the joint-consolidated corporations which involve two or more units and those townships in which the pupils are transferred to other corporations. There were 659 consolidated high schools and 1,050 consolidated elementary schools with three or more teachers reported by the township trustees in 1931-32. The number of rural one-teacher schools is rapidly decreasing, over 300 being eliminated in the period from 1932 to 1934.

It is the purpose of this section to investigate the efficiency of the township as the rural school attendance unit. One hundred townships in which there is but one consolidated school attended by all pupils in the township were selected at random from all of the counties of the state, and the area and school enrollments were secured for each. The only townships selected were those in which there are no incorporated towns or cities, in order that the sample may represent typical rural communities.

Table VIII gives the distribution of elementary and high school enrollments in the consolidated schools of the townships. The median elementary school enrollment is 181 pupils in Grades 1 to 8 and the median high school enrollment is 77 pupils in Grades 9 to 12. The largest elementary school in this group has an enrollment of 423 pupils, while 25 per cent of the elementary schools have fewer than 145 pupils. Only two high schools in the 100 townships have enrollments in excess of 200, the largest enrolling 206 pupils. Twenty-five per cent of the high schools enroll fewer than 60 pupils. These data are sufficient evidence that the townships of Indiana are inadequate as units for school consolidation.

TABLE VIII. ENROLLMENTS IN CONSOLIDATED ELEMENTARY AND HIGH SCHOOLS OF 100 INDIANA TOWNSHIPS, 1934

Number of pupils	Elementary enrollments	High school enrollments
400+	1	0
375-399	0	0
350-374	0	0
325-349	3	0
300-324	1	0
275-299	5	0
250-274	5	0
225-249	11	0
200-224	13	2
175-199	15	0
150-174	17	5
125-149	18	6
100-124	9	8
75- 99	2	31
50- 74	0	36
25- 49	0	12
Total	100	100
Median	181	77

The areas of the townships are given in Table IX. The median township has an area of 36 square miles; the range of areas is from 14 to 56 square miles. In the section of this study devoted to the transportation of pupils it was suggested that the maximum attendance areas should be 200 to 250 square miles. The typical township in Indiana is only about one-sixth as large as the proposed maximum attendance unit.

TABLE IX. AREAS IN SQUARE MILES OF 100 INDIANA SCHOOL TOWNSHIPS

Square miles	Number of townships
48-50	3
45-47	2
42-44	4
39-41	4
36-38	40
33-35	4
30-32	20
27-29	4
24-26	11
21-23	3
18-20	3
15-17	1
12-14	1
Total	100
Area of median township—36 square miles	

The fact that the majority of Indiana consolidated school units are confined to the limits of the administrative corporation suggests that the principal reason for these small units is the inadequacy of the unit of taxation and administration. Consolidation of townships with other corporations is permissible under the Indiana laws, but relatively few such consolidations have been made. This is evidence of the strong tendency to adhere to established units and suggests the reason for the general ineffectiveness of permissive laws for the consolidation of small rural districts. Apparently the only method by which to secure efficient rural school consolidation is the establishment of basic units of administration and taxation which are large enough to permit the organization of maximum attendance areas.

Data on the density of population of these representative townships were presented previously in Table VIII of this study and the inference was made that it is possible to organize schools of efficient size in the localities represented by these townships without extending transportation beyond desirable limits. The existence of township units which have no relationship to the effective organization of schools has limited consolidation to the artificial boundaries established for other purposes. While this situation could be corrected to some extent at the present time by enlarging the local corporations, the fact that considerable consolidation has been effected and the schools located in terms of the civil units would tend to make reorganization a difficult process. The problem of rural school consolidation is much simpler if adequate attendance areas may be developed in the existing administrative unit.

The County Unit

The county unit has been advocated widely as the most desirable local unit for rural schools. The arguments offered in support of the county unit are numerous, but the most important are that this unit is large enough to permit efficient consolidation of schools and that it is an established unit of administration and taxation. Those states which have well-developed county units have experienced less difficulty in rural school organization than have other states which have depended upon combinations of small districts in consolidating schools. However, the desirability of the county as it now exists as a unit of government has been subject to question in recent years. The multiplicity of small local governmental units has been pointed out as one of the principal sources of excessive taxation, and the elimination of many of these units has been advocated as a means for securing greater economy and efficiency in local government. Consolidation of counties and the combination of counties and municipalities for various functions of government has been urged by students of political science in order that duplication of services may be eliminated and the excessive number of local administrative offices reduced. When the county is thus being questioned as a desirable unit of government, the implications of reorganizing schools in terms of this unit should be carefully investigated. It is possible that the further development of the county school unit is a step in the wrong direction so far as efficient local government is concerned.

An analysis of all phases of the county unit problem is beyond the scope of this study. Some evidence on the relation of the county to the development of school attendance areas is presented, however. An inspection of the map in Chart 3 shows that many of the attendance areas suggested for urban school centers include territory in two or more counties. Likewise the organization of rural consolidated units which have villages as centers would necessitate the inclusion of territory in more than one county if units of desirable size are secured. Communities are not necessarily defined by county boundaries and the limitation of the school units to the county would result in many artificial divisions which are related neither to the existence of homogeneous communities nor to the factors which should determine the extent of the school district. It is apparent that any local unit, be it township, city, or county, which has been established for other governmental functions will tend to prevent the organization of efficient school attendance units unless the boundaries of the civil unit can be ignored.

The area of the county is an important measure of its adequacy as a local school unit since there are counties which are so small that attendance areas of efficient size cannot be secured by including the entire county in a single unit. On the other hand, some counties may be large enough to afford the maximum efficiency of school organization.

A distribution of the areas of the 92 counties in Indiana is given in Table X. The median county in Indiana has an area of 398 square miles; the range of the areas is from 85 to 660 square miles. An analysis of the distribution of county areas shows that there are five counties in the state which have areas of less than 200 square miles. Since 200 to 250 square miles has been suggested as the maximum school attendance area, it is evident that these counties are too small for an attendance unit of efficient size. While there may be local conditions in the small counties which would warrant the maintenance of a small school unit, if large units were desirable in these localities it would be

TABLE X. AREAS OF 92 INDIANA COUNTIES

Square miles	Number of counties
650-699	1
600-649	0
550-599	3
500-549	7
450-499	10
400-449	24
350-399	23
300-349	11
250-299	5
200-249	3
150-199	3
100-149	1
50- 99	1
Total	92
Area of median county—398 square miles	

necessary to extend the areas beyond the county lines. The median county of Indiana occupies sufficient area for two attendance units of maximum size. Three attendance areas of 200 square miles could be organized in the largest county of the state. It is evident that only one to three school attendance units of maximum area are possible in any county of Indiana.

Many local conditions prevent the organization of the county into the minimum number of school attendance units. The location in the county of villages, cities, and towns which are logical school centers, the distribution of the rural population, the boundaries of homogeneous communities, and the existence of natural barriers to transportation are some of the factors which affect the location of schools in the county. In order to obtain evidence of the effect of some of these factors on rural school organization, five typical rural counties in Indiana have been selected for study. These counties have few natural barriers to transportation and do not include any large cities. They have been selected to represent communities in which rural school consolidation on a large scale is practical. An attempt was made to locate school centers in terms of local conditions and at the same time to secure the maximum attendance areas. Data on the area, the number of schools, the school population, and the number of pupils transported for each county are given in Table XI. The last two columns in Table XI show the number of proposed school centers and the estimated percentage of increase in the number of pupils to be transported if the schools should be organized as suggested. In locating the school centers in these five counties it was assumed that the schools should be located in villages, towns, or cities and that the maximum transportation distance would not exceed 15 miles for any pupil. The proposed attendance areas were confined to the county.

TABLE XI. AREAS, NUMBER OF SCHOOLS, PUPIL POPULATION, AND PUPILS TRANSPORTED, FOR FIVE INDIANA COUNTIES WITH THE ESTIMATED MINIMUM NUMBER OF SCHOOL CENTERS FOR EACH COUNTY AND THE ESTIMATED INCREASE IN PUPIL TRANSPORTATION

County	Area in square miles	Number of schools in operation		School enrollment		Pupils transported	Number of proposed schools	Estimated per cent of increase in transportation
		Elementary	High school	Elementary	High school			
1	414	14	11	1,814	757	1,496	5	42.7
2	374	16	8	2,405	1,109	1,819	5	7.6
3	306	14	10	2,547	1,042	1,981	5	15.0
4	425	36	11	3,752	1,370	2,099	4	27.3
5	336	26	8	2,694	997	1,649	5	30.0
Total	1,855	106	48	13,212	5,275	9,044	24	23.7

Four or five school centers are possible for each of these counties when the conditions stated above are met. Each center provides both elementary and high school facilities. A total of 24 centers is proposed for the five counties. Since there are now 106 different schools in

operation in these counties, this would be considerable improvement over the existing school organization. However, there are only five of the proposed high school centers that would have enrollments in excess of 350 pupils, the largest school enrolling approximately 750 pupils. In thirteen of the centers there would be fewer than 200 high school pupils enrolled. In only three or four cases would it be possible to combine two of the proposed centers for high school purposes and in each instance it would be necessary to transport the high school pupils approximately 10 miles farther than the distance they would be transported to the proposed center. The inconvenience of such an arrangement is an obstacle to organizing high schools which serve several rural elementary school units.

Altho the majority of the high schools of the proposed centers in these five counties are smaller than the minimum enrollment of 400, all but two of the 24 elementary schools meet the minimum enrollment of 300. The smallest elementary school would have an enrollment of approximately 225 pupils, and the largest elementary enrollment would be approximately 2,000 pupils. These data are an excellent illustration of the fact that it is less difficult to organize efficient elementary school districts within a county than it is to organize efficient high school units.

Sixteen of the 24 proposed centers are located near enough to the county boundaries to serve territory in adjoining counties. If county lines were ignored and the attendance area extended to a radius of 8 miles, the enrollment in most of these 16 schools would be increased 100 per cent or more. In several cases the proposed school centers would not be necessary if the pupils residing in the outer limits of the county were transferred to school centers in adjacent counties.

It is interesting to note that the proposed organization, which reduces the number of school centers in these counties from 106 to 24, would increase the number of pupils to be transported only 24 per cent. At the time the data were collected approximately 50 per cent of all the pupils enrolled in the schools in these counties were being transported. Under the proposed organization approximately 60 per cent of the pupils would be transported. The increased cost of transportation would be more than balanced by the economy of the larger schools. The number of teachers required for the 24 school centers would be approximately 78 less in the elementary schools and 83 less in the high schools than the number employed under the present organization. In addition, increased educational efficiency would be secured. While confining the school attendance areas to the local county unit does not permit the most efficient organization of the schools, the superiority of the county over the township as the local unit cannot be questioned.

The data presented in this section are evidence that the organization of efficient school attendance districts is a difficult problem if the county is used as the basic local unit. If attendance in local schools is limited to residents of the county, many small schools will be necessary. The observance of arbitrary boundaries tends to place artificial limits on the school units. While it is necessary to maintain some sort of local unit for administrative and taxing purposes, it is evident that the optimum local school units must be independent of existing civil units.

Summary

The conclusions concerning the factors affecting the organization of school attendance units have been summarized in the sections of this study devoted to the particular problems and recapitulation here is not deemed necessary. While the standards proposed for the local school unit can be accepted as only tentative, they indicate some of the elements which warrant consideration in organizing school attendance units in states similar to Indiana. In states where local conditions vary considerably from those represented in this study, the standards would need revision. However, it is reasonable to believe that the standards proposed in this study for the size of school, distance of transportation, and size of the attendance area are valid criteria for the organization of school units in many localities.

The whole problem of the reorganization of local government is one which vitally affects the schools. The extent to which schools should be independent of civil units is an unanswered question. While it is evident that the present practice of organizing school units in terms of the township, county, and municipality has led to the establishment of many inefficient schools, the future relation of the school district to these units is a fundamental element in the problem of reconstructing local government. The evidence presented in this study indicates that the separation of rural and urban units for school purposes and the practice of confining school attendance areas to the limits of the civil unit prevent the organization of efficient schools. It is quite possible, however, that when the relationship of all the factors is clearly defined the standards suggested for school attendance areas would be inapplicable to many localities.

The functions of administration, supervision, and school support have to be given consideration in defining the local school unit. Further research is needed to discover the optimum combination of these functions with the standards for a minimum attendance unit.

Likewise the function of the school in relation to other social services in the community may have considerable bearing on the size and location of the attendance unit. For example, there is some validity to the argument that the school should serve as a community center, particularly in rural neighborhoods. In this case the attendance unit would be defined in terms of homogeneous communities. Altho such an organization would have much more merit than the current practice of adhering to civil units, it is questionable whether educational efficiency and the economy of operation should be sacrificed to any great extent for other social considerations.

The standards proposed in this study are not suggested as measures of the optimum local school unit. However, the extent to which the attendance area meets the minimum standards for the factors considered in this investigation will determine in some measure the adequacy of the local school unit.

List of Bulletins in the Field of Education, Indiana University

The following is a list of the bulletins published by the School of Education, Indiana University.

All bulletins which are available at the present time may be secured for fifty cents ($.50) per copy, with the exception of the *Second Revision of the Bibliography of Educational Measurements;* the *Bibliography of School Buildings, Grounds and Equipment, Part I; The Philosophy of Human Relations—Individual and Collective;* the *Bibliography of School Surveys and of References on School Surveys;* and the *Bibliography of College and University Buildings, Grounds, and Equipment,* which may be secured for seventy-five cents ($.75) per copy. *The Philosophy of Human Relations—Individual and Collective* and all fifty-cent bulletins of the School of Education may be obtained from the University Bookstore. The other four bulletins should be ordered thru the Bureau of Coöperative Research, Indiana University.

Proceedings of the High School Principals' Conference (November 23 and 24, 1923). Vol. I, No. 1, 1924. 85 p. (Supply exhausted.)

Investigation of Nursing as a Professional Opportunity for Girls. Part I, Technical Study; Part II, Vocational Information Bulletin. By Florence E. Blazier. Vol. I, No. 2, 1924. 69 p.

Proceedings of the Eleventh Conference on Educational Measurements. Vol. I, No. 3, 1925. 141 p.

Proceedings of the High School Principals' Conference (November 14 and 15, 1924). Vol. I, No. 4, 1925. 49 p. (Supply exhausted.)

First Revision of the Bibliography of Educational Measurements. Compiled by the Bureau of Coöperative Research. Vol. I, No. 5, 1925. 147 p. (Supply exhausted.)

Proceedings of the Twelfth Conference on Educational Measurements. Vol. I, No. 6, 1925. 76 p.

The Effect of Population upon Ability to Support Education. By Harold F. Clark. Vol. II, No. 1, 1925. 28 p.

Proceedings of the High School Principals' Conference (November 20 and 21, 1925). Vol. II, No. 2, 1925. 77 p. (Supply exhausted.)

A Cross-Indexed Bibliography on School Budgets. By Harold F. Clark. Vol. II, No. 3, 1926. 66 p.

A Comparison of the Results Made on Certain Standardized Tests by Pupils in the Bloomington High School Who Were Taught in Classes of the Same Grade by University Student Teachers and by Regular High School Teachers. By Carl G. F. Franzén. Vol. II, No. 4, 1926. 19 p.

Proceedings of the Thirteenth Annual Conference on Educational Measurements. Vol. II, No. 5, 1926. 103 p.

When to Issue School Bonds. By Harold Florian Clark and Paul Royalty. Vol. II, No. 6, 1926. 16 p.

Students' Attitude Toward Examinations. By Grover T. Somers. Vol. III, No. 1, 1926. 48 p.

Proceedings of the High School Principals' Conference (November 12 and 13, 1926). Vol. III, No. 2, 1926. 27 p.

Index Numbers in School Administration. By Harold F. Clark. Vol. III, No. 3, 1927. 35 p.

Topical Analysis of 234 School Surveys. Compiled by the Bureau of Coöperative Research. Vol. III, No. 4, 1927. 111 p. (Supply exhausted.)

Proceedings of the Fourth Annual Conference on Elementary Supervision. Vol. III, No. 5, 1927. 64 p.

Proceedings of the Fourteenth Annual Conference on Educational Measurements. Vol. III, No. 6, 1927. 66 p.

Some Phases of the Junior College Movement. By I. Owen Foster, Harold F. Clark, Willard W. Patty, and Leo M. Chamberlain. Vol. IV, No. 1, 1927. 125 p.

Second Revision of the Bibliography of Educational Measurements. By Henry Lester Smith and Wendell William Wright. Vol. IV, No. 2, 1927. 251 p.

Bibliography of School Buildings, Grounds, and Equipment. By Henry Lester Smith and Leo Martin Chamberlain. Vol. IV, No. 3, 1928. 326 p.

Proceedings of the High School Principals' Conference (November 18 and 19, 1927). Vol. IV, No. 4, 1928. 54 p.

The Economic Effects of Education. By Harold F. Clark. Vol. IV, No. 5, 1928. 39 p.

Proceedings of the Fifteenth Annual Conference on Educational Measurements. Vol. IV, No. 6, 1928. 73 p.

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The Philosophy of Human Relations: Individual and Collective—A Source Book. By Henry Lester Smith and Harold Littell. Vol. VII, No. 3, 1931. 326 p.

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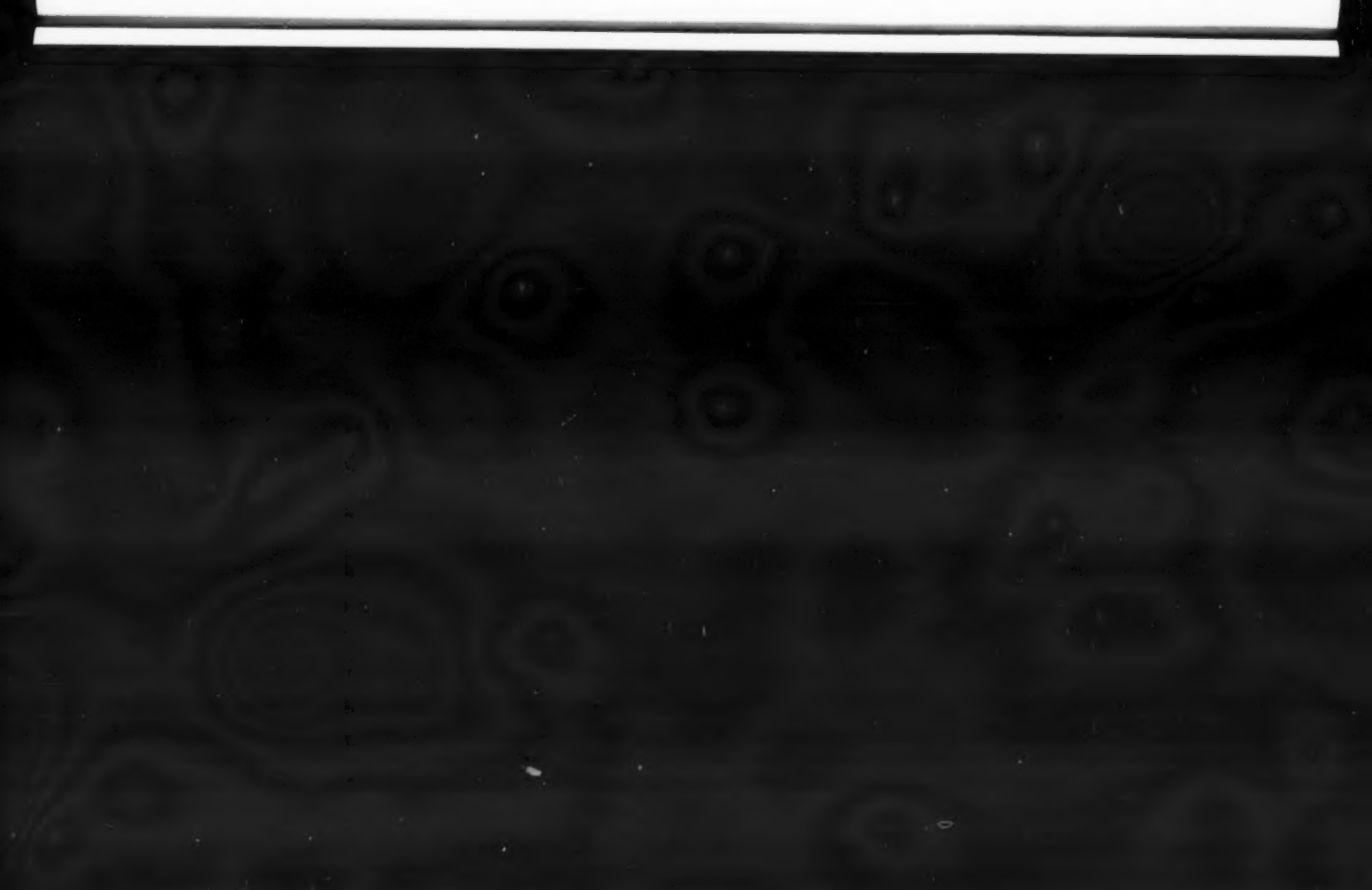

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Proceedings of the Twentieth Annual Conference on Educational Measurements. Vol. X, No. 1, 1933. 98 p.

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